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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/811,427	HAMILTON ET AL.	
	Examiner	**Art Unit**	
	Andy S. Rao	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 13 February 2009.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-39 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-39 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The indicated allowability of claims 1-39 as discussed in the Office Action of 12/23/08 is withdrawn in view of the newly discovered reference(s) to Werner et al., (US Patent 6,668,088: hereinafter referred to as "Werner"). Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hui in view of Hurst and further in view of Werner et al., (hereinafter referred to as "Werner").

Hui discloses a method for robust single-pass variable bit rate video encoding (Hui: column 3, lines 65-67; column 4, lines 1-16), the method comprising: determining a buffer size for keeping track of over/underused bits generated during the encoding of a video sequence (Hui: column 7, lines 53-57), the buffer size being a function of at least a target bit rate (Hui: column 6, lines 55-67) for the video sequence and a length of the video sequence (Hui: column 11, lines 10-25); initializing the buffer to a default initial fullness (Hui: column 7, lines 25-35) and for each flame of the video sequence, performing the following steps: allocating a number of bits to the frame (Hui: column 9, lines 15-23); determining a quant with which to encode the frame, the quant being a function of at least the buffer's fullness (Hui: column 9, lines 50-67); encoding the

frame according to the determined quant (Hui: column 12, lines 23-35); and outputting the encoded frame (Hui: figure 3, element 308); updating the fullness of the buffer based on any over/underused bits for the frame (Hui: column 9, lines 30-37), as in claim 1. However, Hui fails disclose that the method is implemented on a computer or determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control, as in the claim. Hurst discloses that is known to implement VBV modeled (Hurst: column 8, lines 15-55) rate encoding methods (Hurst: column 6, lines 15-65) on a computer (Hurst: column 19, lines 30-59) in order to implement rate control across distributed networks (Hurst: column 1, lines 55-67; column 2, lines 1-18), as in the claim. Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to implement the Hui system as a computer system as shown by Hurst in order to implement the Hui system across distributed networks. The Hui method, now modified to be implemented on a computer as shown by Hurst, has a majority of the features of claim 1, but still fails disclose determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control. Werner discloses a digital signal compression encoding method which implements truncating/modifying the quantziation interval (i.e. quantization envelope control) from a base step size (Werner: column 2, lines 10-30; column 3, lines 15-20; column 4, lines 10-25) based on the type of frame (Werner: column 14, lines 40-50) and wherein the fluctuation of the base quant envelope is

controlled (Werner: column 10, lines 54-67; column 11, lines 1-15) in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate (Werner: column 2, lines 7-10). Accordingly, given this teaching, it would have been further obvious for one of ordinary skill in the art at the time of the invention to further incorporate the Werner teaching of quantization interval truncation into the Hui-Hurst method in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate that the original Hui-Hurst combination. The Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has all of the features of claim 1.

Regarding claim 2, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein frames in a GOP are encoded, the method further comprising: allocating a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer for keeping track of over/underused bits for I frames (Hui: column 10, lines 55-60), a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for P frames (Hui: column 10, lines 55-60) and a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for B frames (Hui: column 7, lines 65-67; column 8, lines 1-5); initializing each segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer to a default initial fullness (Hui: column 9, lines 30-37); determining a number of I frames per GOP, a number of P frames per GOP and a number of B frames per GOP, based on a nominal GOP pattern; for each frame of the video sequence (Hui: column 7, lines 25-30), determining the quant with which to encode that frame as a function of at least the fullness of the segment of the buffer for that frame type (Hui:

column 9, lines 45-67); and for each GOP of the video sequence, performing the following steps: before encoding any frame of that GOP, calculating a GOP bit target for that GOP, the GOP bit target being a function of at least the number of I frames, P frames and B frames per GOP, the target bit rate for the video sequence and any bits carried over from a last encoded GOP (Hui: column 6, lines 60-67; column 7, lines 1-15); after encoding each frame of that GOP, calculating over/underused bits by subtracting allocated bits from actual used bits, adding any over/underused bits to an appropriate buffer segment to an extent to which the appropriate buffer segment is not over/underflowed and storing any over/underflow bits in a counter (Hui: column 11, lines 25-40); and after encoding all frames of that GOP, redistributing over/underused bits between the segments of the buffer as a function of at least a total number of over/underused bits in the buffer and the number of I flames, P frames and B frames per GOP and storing an indication of a number of over/underused bits with respect to the allocated target bits for that GOP to carry over to the next GOP (Hui: column 12, lines 20-40), as in claim 2.

Regarding claims 3-4, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has storing information concerning over/underused of at least some encoded frames by frame type; and using the stored information concerning over/underused bits of frames of a specific frame type in determining quants with which to encode frames of that type (Hui: column 11, lines 1-15; column 9, lines 45-67), as in the claims.

Regarding claim 5, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein

the buffer is virtual buffer storing information concerning a number of over/underused bits, without storing the over/underused bits themselves (Hui: column 7, lines 53-54), as in the claim.

Regarding claim 6, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein before encoding any frame, initializing to a default initial value at least one parameter from a group of parameters consisting of: a base quant envelope for each frame type (Hui: column 10, lines 40-60); a base quant envelope control for each frame type (Hui: column 9, lines 45-67); ratio information concerning frame types (Hui: column 7, lines 20-35); and a frame complexity parameter for each frame type (Hui: column 7, lines 65-67), as claim 6.

Regarding claim 7, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein for each GOP of the video sequence, before encoding any frame of that GOP, determining whether the fullness of each segment of the buffer is at least at an associated minimal value (Hui: column 9, lines 1-10); and responsive to the fullness of a segment of the buffer not being at least at the associated minimal value, adjusting the fullness of the segment accordingly (Hui: column 7, lines 55-67; column 8, lines 1-5).

Regarding claim 8, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein allocating a number of bits to a frame further comprises: allocating bits to the frame according to a modified TM5 reference model (Hui: column 7, lines 39-41), the allocation utilizing at least one an additional parameter from a group of parameters consisting of: at least one frame complexity parameter for a last encoded frame of a frame type (Hui: column 7, lines 65-67;

column 8, lines 1-12); a GOP bit target for the GOP being processed (Hui: column 6, lines 50-67; column 7, lines 1-12); ratio information concerning frame types within a GOP (Hui: column 7, lines 20-37); the number of I frames per GOP; the number of P frames per GOP; and the number of B frames per GOP (Hui: column 11,lines 20-25), as in the claim.

Regarding claim 9, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein allocating a number of bits to a frame further comprises: allocating bits to the frame according to a TM5 reference model (Hui: column 7, lines 39-41), as in the claim.

Regarding claims 10-11, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein determining a quant with which to encode the frame further comprises: prior to determining the quant, normalizing the fullness of the segment (Hui: column 7, lines 65-67; column 8, lines 1-5) corresponding to the type of frame to encode (Hui: column 9, lines 33-37), based on at least the segment size and the non-normalized segment fullness (Hui: column 11, lines 25-35); and determining the quant as a function of at least a base quant envelope and the normalized segment fullness (Hui: column 9, lines 45-67), as in the claims.

Regarding claim 12, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein after encoding each frame of the video sequence, determining whether the encoding of that frame causes a VBV buffer underflow (Hui: column 7, lines 53-57); responsive to determining that the encoding of that flame causes a VBV buffer underflow, adjusting the quant used to encode the

frame (Hui: column 8, lines 30-40); and re-encoding the frame with the adjusted quant so as to eliminate the VBV buffer underflow (Hui: column 12, lines 36-67), as in the claim.

Regarding claims 13-14, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein after encoding each frame of the video sequence, updating at least one parameter from a group of parameters consisting of: a base quant envelope for the encoded frame type (Hui: column 9, lines 60-67); ratio information concerning frame types (Hui: column 11, lines 20-25); and a frame complexity parameter for the encoded frame type (Hui: column 7, lines 65-67; column 8, lines 1-7), as in the claims.

Regarding claim 15, the Hui method, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein adding the counter of unallocated over/underflow bits to the buffer segment corresponding to the type of frame to encode, to an extent that the buffer segment is not overflowed or underflowed; and retaining any over/underflow bits that cannot be added to the segment in the counter (Hui: column 11, lines 27-65), as in the claim.

Hui discloses a system for robust single-pass variable bit rate video encoding (Hui: figure 2), the system comprising: means for determining a buffer size for keeping track of over/underused bits generated during the encoding of a video sequence (Hui: column 7, lines 53-57), the buffer size being a function of at least a target bit rate (Hui: column 6, lines 55-67) for the video sequence and a length of the video sequence (Hui: column 11, lines 10-25); means for initializing the buffer to a default initial fullness (Hui: column 7, lines 25-35) and for each flame of the video sequence, performing the following steps: allocating a number of bits to the frame

(Hui: column 9, lines 15-23); means for determining a quant with which to encode the frame, the quant being a function of at least the buffer's fullness (Hui: column 9, lines 50-67); means for encoding the frame according to the determined quant (Hui: column 12, lines 23-35); and means for updating the fullness of the buffer based on any over/underused bits for the frame (Hui: column 9, lines 30-37), as in claim 16. However, Hui fails disclose that the system is implemented as a computer system or determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control, as in the claim. Hurst discloses that is known to implement VBV modeled (Hurst: column 8, lines 15-55) rate encoders (Hurst: column 6, lines 15-65) as a computer system (Hurst: column 19, lines 30-59) in order to implement rate control across distributed networks (Hurst: column 1, lines 55-67; column 2, lines 1-18), as in the claim. Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to implement the Hui system as a computer system as shown by Hurst in order to implement the Hui system across distributed networks. The Hui system, now modified to be implemented as a computer system as shown by Hurst, has a majority of the features of claim 16, but still fails disclose determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control. Werner discloses a digital signal compression encoding apparatus which implements truncating/modifying the quantziation interval (i.e. quantization envelope control) from a base

step size (Werner: column 2, lines 10-30; column 3, lines 15-20; column 4, lines 10-25) based on the type of frame (Werner: column 14, lines 40-50) and wherein the fluctuation of the base quant envelope is controlled (Werner: column 10, lines 54-67; column 11, lines 1-15) in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate (Werner: column 2, lines 7-10). Accordingly, given this teaching, it would have been further obvious for one of ordinary skill in the art at the time of the invention to further incorporate the Werner teaching of quantization interval truncation into the Hui-Hurst apparatus in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate that the original Hui-Hurst combination. The Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, has all of the features of claim 16.

Regarding claim 17, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses wherein frames in a GOP are encoded, the system further comprising: means for allocating a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer for keeping track of over/underused bits for I frames (Hui: column 10, lines 55-60), a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for P frames (Hui: column 10, lines 55-60) and a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for B frames (Hui: column 7, lines 65-67; column 8, lines 1-5); means for initializing each segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer to a default initial fullness (Hui: column 9, lines 30-37); means for determining a number of I frames per GOP, a number of P frames per GOP and a number of

B frames per GOP, based on a nominal GOP pattern; for each frame of the video sequence (Hui: column 7, lines 25-30), determining the quant with which to encode that frame as a function of at least the fullness of the segment of the buffer for that frame type (Hui: column 9, lines 45-67); means for performing the following steps for each GOP of the video sequence: before encoding any frame of that GOP, calculating a GOP bit target for that GOP, the GOP bit target being a function of at least the number of I frames, P frames and B frames per GOP, the target bit rate for the video sequence and any bits carried over from a last encoded GOP (Hui: column 6, lines 60-67; column 7, lines 1-15); after encoding each frame of that GOP, calculating over/underused bits by subtracting allocated bits from actual used bits, adding any over/underused bits to an appropriate buffer segment to an extent to which the appropriate buffer segment is not over/underflowed and storing any over/underflow bits in a counter (Hui: column 11, lines 25-40); and after encoding all frames of that GOP, redistributing over/underused bits between the segments of the buffer as a function of at least a total number of over/underused bits in the buffer and the number of I flames, P frames and B frames per GOP and storing an indication of a number of over/underused bits with respect to the allocated target bits for that GOP to carry over to the next GOP (Hui: column 12, lines 20-40), as in claim 17.

Regarding claims 18-19, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses means for storing information concerning over/underused of at least some encoded frames by frame type; and using the stored information concerning over/underused bits of frames of a specific frame type in determining quants with

which to encode frames of that type (Hui: column 11, lines 1-15; column 9, lines 45-67), as in the claims.

Regarding claim 20, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses wherein the buffer is a virtual buffer storing information concerning a number of over/underused bits, without storing the over/underused bits themselves (Hui: column 7, lines 53-54), as in the claim.

Regarding claims 21-22, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses a means for determining a quant with which to encode the frame further comprises: means for, prior to determining the quant, normalizing the fullness of the segment (Hui: column 7, lines 65-67; column 8, lines 1-5) corresponding to the type of frame to encode (Hui: column 9, lines 33-37), based on at least the segment size and the non-normalized segment fullness (Hui: column 11, lines 25-35); and means for determining the quant as a function of at least a base quant envelope and the normalized segment fullness (Hui: column 9, lines 45-67), as in the claims.

Regarding claim 23, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses a means for, after encoding each frame of the video sequence, determining whether the encoding of that frame causes a VBV buffer underflow (Hui: column 7, lines 53-57); means for, responsive to determining that the encoding of that flame causes a VBV buffer underflow, adjusting the quant used to encode the frame (Hui: column 8, lines 30-40); and

means for re-encoding the frame with the adjusted quant so as to eliminate the VBV buffer underflow (Hui: column 12, lines 36-67), as in the claim.

Hui discloses a system for robust single-pass variable bit rate video encoding (Hui: figure 2), the system comprising: a portion configured to determine a buffer size for keeping track of over/underused bits generated during the encoding of a video sequence (Hui: column 7, lines 53-57), the buffer size being a function of at least a target bit rate (Hui: column 6, lines 55-67) for the video sequence and a length of the video sequence (Hui: column 11, lines 10-25); a portion configured to initialize the buffer to a default initial fullness (Hui: column 7, lines 25-35); and a portion configured to perform the following steps: allocating a number of bits to the frame (Hui: column 9, lines 15-23); determine a quant with which to encode the frame, the quant being a function of at least the buffer's fullness (Hui: column 9, lines 50-67); encode the frame according to the determined quant (Hui: column 12, lines 23-35); update the fullness of the buffer based on any over/underused bits for the frame (Hui: column 9, lines 30-37), as in claim 24. However, Hui fails disclose that the system is implemented as a computer system or determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control, as in the claim. Hurst discloses that is known to implement VBV modeled (Hurst: column 8, lines 15-55) rate encoders (Hurst: column 6, lines 15-65) as a computer system (Hurst: column 19, lines 30-59) in order to implement rate control across distributed networks (Hurst: column 1, lines 55-67; column 2, lines 1-18), as in the claim. Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to implement the Hui

system as a computer system as shown by Hurst in order to implement the Hui system across distributed networks. The Hui system, now modified to be implemented as a computer system as shown by Hurst, has a majority of the features of claim 24, but still fails disclose determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control. Werner discloses a digital signal compression encoding apparatus which implements truncating/modifying the quantziation interval (i.e. quantization envelope control) from a base step size (Werner: column 2, lines 10-30; column 3, lines 15-20; column 4, lines 10-25) based on the type of frame (Werner: column 14, lines 40-50) and wherein the fluctuation of the base quant envelope is controlled (Werner: column 10, lines 54-67; column 11, lines 1-15) in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate (Werner: column 2, lines 7-10). Accordingly, given this teaching, it would have been further obvious for one of ordinary skill in the art at the time of the invention to further incorporate the Werner teaching of quantization interval truncation into the Hui-Hurst apparatus in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate that the original Hui-Hurst combination. The Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, has all of the features of claim 24.

Regarding claim 25, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization

interval truncation, discloses wherein frames in a GOP are encoded, the method further comprising: a portion configured to allocate a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer for keeping track of over/underused bits for I frames (Hui: column 10, lines 55-60), a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for P frames (Hui: column 10, lines 55-60) and a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for B frames (Hui: column 7, lines 65-67; column 8, lines 1-5); a portion configured to initialize each segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer to a default initial fullness (Hui: column 9, lines 30-37); a portion configured to initialize a number of I frames per GOP, a number of P frames per GOP and a number of B frames per GOP, based on a nominal GOP pattern; a portion for configured to determine the quant with which to encode that frame as a function of at least the fullness of the segment of the buffer for that frame type (Hui: column 9, lines 45-67); a portion configured to perform the following steps for each GOP of the video sequence: before encoding any frame of that GOP, calculating a GOP bit target for that GOP, the GOP bit target being a function of at least the number of I frames, P frames and B frames per GOP, the target bit rate for the video sequence and any bits carried over from a last encoded GOP (Hui: column 6, lines 60-67; column 7, lines 1-15); after encoding each frame of that GOP, calculating over/underused bits by subtracting allocated bits from actual used bits, adding any over/underused bits to an appropriate buffer segment to an extent to which the appropriate buffer segment is not over/underflowed and storing any over/underflow bits in a counter (Hui: column 11, lines 25-40); and after encoding all frames of that GOP, redistributing over/underused bits between the segments of the buffer as a function of at least a total number of over/underused bits

in the buffer and the number of I flames, P frames and B frames per GOP and storing an indication of a number of over/underused bits with respect to the allocated target bits for that GOP to carry over to the next GOP (Hui: column 12, lines 20-40), as in claim 25.

Regarding claims 26-27, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses a portion configured to store information concerning over/underused of at least some encoded frames by frame type; and a portion configured to use the stored information concerning over/underused bits of frames of a specific frame type in determining quants with which to encode frames of that type (Hui: column 11, lines 1-15; column 9, lines 45-67), as in the claims.

Regarding claim 28, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses wherein the buffer is a virtual buffer storing information concerning a number of over/underused bits, without storing the over/underused bits themselves (Hui: column 7, lines 53-54), as in the claim.

Regarding claims 29-30, the Hui system, now modified to be implemented as a computer system as shown by Hurst, discloses a portion configured to determine a quant with which to encode the frame further comprises: a portion configured to, prior to determining the quant, normalizing the fullness of the segment (Hui: column 7, lines 65-67; column 8, lines 1-5) corresponding to the type of frame to encode (Hui: column 9, lines 33-37), based on at least the segment size and the non-normalized segment fullness (Hui: column 11, lines 25-35); a portion

configured to determine the quant as a function of at least a base quant envelope and the normalized segment fullness (Hui: column 9, lines 45-67), as in the claims.

Regarding claim 31, the Hui apparatus, now modified to be implemented on a computer as shown by Hurst and also implementing the Werner element for implementing quantization interval truncation, discloses a portion configured to, after encoding each frame of the video sequence, determining whether the encoding of that frame causes a VBV buffer underflow (Hui: column 7, lines 53-57); a portion configured to, responsive to determining that the encoding of that flame causes a VBV buffer underflow, adjusting the quant used to encode the frame (Hui: column 8, lines 30-40); and a portion configured to re-encode the frame with the adjusted quant so as to eliminate the VBV buffer underflow (Hui: column 12, lines 36-67), as in the claim.

Hui discloses a method for robust single-pass variable bit rate video encoding (Hui: column 3, lines 65-67; column 4, lines 1-16), the method comprising: determining a buffer size for keeping track of over/underused bits generated during the encoding of a video sequence (Hui: column 7, lines 53-57), the buffer size being a function of at least a target bit rate (Hui: column 6, lines 55-67) for the video sequence and a length of the video sequence (Hui: column 11, lines 10-25); initializing the buffer to a default initial fullness (Hui: column 7, lines 25-35) and for each flame of the video sequence, performing the following steps: allocating a number of bits to the frame (Hui: column 9, lines 15-23); determining a quant with which to encode the frame, the quant being a function of at least the buffer's fullness (Hui: column 9, lines 50-67); encoding the frame according to the determined quant (Hui: column 12, lines 23-35); and updating the fullness of the buffer based on any over/underused bits for the frame (Hui: column 9, lines 30-37), as in claim 32. However, Hui fails disclose that the method is implemented as a computer readable

medium containing a computer program product comprising program codes or determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control, as in the claim. Hurst discloses that is known to implement VBV modeled (Hurst: column 8, lines 15-55) rate encoding methods (Hurst: column 6, lines 15-65) as a computer readable medium containing a computer program product comprising program codes (Hurst: column 19, lines 30-59) in order to implement rate control across distributed networks (Hurst: column 1, lines 55-67; column 2, lines 1-18), as in the claim. Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to implement the Hui method as a computer readable medium containing a computer program product comprising program codes as shown by Hurst in order to implement the Hui method across distributed networks. The Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst, has a majority of the features of claim 32, but still fails to disclose determining a quant while accounting for a base quant envelope and a base quant envelope control associated with the frame, wherein the base quant envelope and the base quant envelope control are based on the type of the frame, and the fluctuation of the base quant envelope is controlled by the base quant envelope control, as in the claim. Werner discloses a digital signal compression encoding method which implements truncating/modifying the quantziation interval (i.e. quantization envelope control) from a base step size (Werner: column 2, lines 10-30; column 3, lines 15-20; column 4, lines 10-25) based on the type of frame (Werner: column 14, lines 40-50) and wherein the

fluctuation of the base quant envelope is controlled (Werner: column 10, lines 54-67; column 11, lines 1-15) in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate (Werner: column 2, lines 7-10). Accordingly, given this teaching, it would have been further obvious for one of ordinary skill in the art at the time of the invention to further incorporate the Werner teaching of quantization interval truncation into the Hui-Hurst apparatus in order to implement a higher quality of compression to be achieved at a given bit-rate or a reduction in bit-rate that the original Hui-Hurst combination. The Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst and also implementing the Werner quantization interval truncation, has all of the features of claim 32.

Regarding claim 33, the Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst and also implementing the Werner quantization interval truncation, has wherein frames in a GOP are encoded, the computer program product further comprising: program code for allocating a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer for keeping track of over/underused bits for I frames (Hui: column 10, lines 55-60), a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for P frames (Hui: column 10, lines 55-60) and a segment (Hui: column 7, lines 65-67; column 8, lines 1-5) for keeping track of over/underused bits for B frames (Hui: column 7, lines 65-67; column 8, lines 1-5); program code for initializing each segment (Hui: column 7, lines 65-67; column 8, lines 1-5) of the buffer to a default initial fullness (Hui: column 9, lines 30-37); program code for determining a number of I frames per GOP, a number of P frames per GOP and a number of B

frames per GOP, based on a nominal GOP pattern; program code for determining the quant with which to encode that frame as a function of at least the fullness of the segment of the buffer for that frame type for each frame of the video sequence (Hui: column 9, lines 45-67); and program code for performing the following steps: before encoding any frame of that GOP, calculating a GOP bit target for that GOP, the GOP bit target being a function of at least the number of I frames, P frames and B frames per GOP, the target bit rate for the video sequence and any bits carried over from a last encoded GOP (Hui: column 6, lines 60-67; column 7, lines 1-15); after encoding each frame of that GOP, calculating over/underused bits by subtracting allocated bits from actual used bits, adding any over/underused bits to an appropriate buffer segment to an extent to which the appropriate buffer segment is not over/underflowed and storing any over/underflow bits in a counter (Hui: column 11, lines 25-40); and after encoding all frames of that GOP, redistributing over/underused bits between the segments of the buffer as a function of at least a total number of over/underused bits in the buffer and the number of I flames, P frames and B frames per GOP and storing an indication of a number of over/underused bits with respect to the allocated target bits for that GOP to carry over to the next GOP (Hui: column 12, lines 20-40), as in claim 33.

Regarding claims 34-35, the Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst and also implementing the Werner quantization interval truncation, has program code for storing information concerning over/underused of at least some encoded frames by frame type; and program code for using the stored information concerning over/underused bits of

frames of a specific frame type in determining quants with which to encode frames of that type (Hui: column 11, lines 1-15; column 9, lines 45-67), as in the claims.

Regarding claim 36, the Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst, has wherein the buffer is a virtual buffer storing information concerning a number of over/underused bits, without storing the over/underused bits themselves (Hui: column 7, lines 53-54), as in the claim.

Regarding claims 37-38, the Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst and also implementing the Werner quantization interval truncation, has program code for determining a quant with which to encode the frame further comprises: means for, prior to determining the quant, normalizing the fullness of the segment (Hui: column 7, lines 65-67; column 8, lines 1-5) corresponding to the type of frame to encode (Hui: column 9, lines 33-37), based on at least the segment size and the non-normalized segment fullness (Hui: column 11, lines 25-35); and program code for determining the quant as a function of at least a base quant envelope and the normalized segment fullness (Hui: column 9, lines 45-67), as in the claims.

Regarding claim 39, the Hui method, now modified to be implemented as a computer readable medium containing a computer program product comprising program codes as shown by Hurst and also implementing the Werner quantization interval truncation, has program code for, after encoding each frame of the video sequence, determining whether the encoding of that frame causes a VBV buffer underflow (Hui: column 7, lines 53-57); program code for, responsive to determining that the encoding of that flame causes a VBV buffer underflow,

adjusting the quant used to encode the frame (Hui: column 8, lines 30-40); and program code for re-encoding the frame with the adjusted quant so as to eliminate the VBV buffer underflow (Hui: column 12, lines 36-67), as in the claim.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Keesman discloses a device and method for coding video pictures. Filippini discloses a quantization method and system for video MPEG applications and a computer program product therefor.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy S. Rao whose telephone number is (571)-272-7337. The examiner can normally be reached on Monday-Friday 8 hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571)-272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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